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RADIUM

EDITED BY
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AND
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VOL. XIII JUNE-JULY, 1919 Nos. 3-4

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A MONTHLY JOURNAL DEVOTED TO THE CHEMISTRY PHYSICS AND THERAPEUTICS OF RADIUM AND RADIO-ACTIVE SUBSTANCES

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RADIUM

A MONTHLY JOURNAL DEVOTED TO THE CHEMISTRY, PHYSICS AND THERAPEUTICS OF RADIUM AND RADIO-ACTIVE SUBSTANCES

Edited and Published by Charles H. Viol, Ph. D., and William H. Cameron, M. D. with the assistance of collaborators working in the fields of Radiochemistry, Radioactivity and Radiumtherapy.

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VOL. XIII JUNE-JULY, 1919 Nos. 3-4

A REPORT OF THE WORK OF THE MANCHESTER AND DISTRICT RADIUM INSTITUTE

FROM JANUARY 1ST, 1918, TO DECEMBER 31ST, 1918.

BY ARTHUR BURROWS, M.D., *Radiologist.*

BETWEEN January 1st, 1918, and December 31st, 1918, 648 cases have presented themselves at the Manchester and District Radium Institute with a view to Radium treatment, an increase of 60 patients over the previous year.

Mr. Lupton, the Physicist, reports that 365 emanation plates, 968 emanation tubes, making a total of 1,333, were made during the year.

Mr. Lupton has during the greater part of the year been engaged for a portion of his time at the University, but now that the war is practically over he will be released from those duties and be able to employ that time in the new Research Laboratory. This Laboratory is now completed and will come into full use during the coming year.

Forty-eight cases of malignant disease, exclusive of Rodent Ulcer, were rendered free from symptoms and signs during the course of the year. This represents 11.75 per cent. of the cancerous cases treated, an improvement of over 2 per cent. on the year 1917. These 48 cases consisted of 1 case of Carcinoma of the Body of the Uterus, 2 cases of Carcinoma of the Bladder, 8 of Carcinoma of the Breast, 16 of Carcinoma of the Cervix of the Uterus, 2 of Carcinoma of the Lip, 4 of Carcinoma of the Mouth, 2 of Carcinoma of the Parotid Gland, 9 of Carcinoma of the Skin, 3 of Carcinoma of the Vulva, and 1 case of Sarcoma.

It will be seen that Carcinoma of the Cervix of the Uterus has given the best results from Radium Treatment, and the improvement in the percentage of cases well at the end of 1918 as against previous years, is

largely accounted for by the satisfactory results obtained in the treatment of Cancer of the Uterus.

Eighteen cases of Rodent Ulcer were apparently cured during the year, representing nearly a half of the total treated. Besides this 26 non-malignant conditions were cured.

No cures of Exophthalmic Goitre are reported, as it is usual even in the best results for some slight residual symptoms to remain; but a large number of these patients were so much improved that they were able to resume their normal occupations.

There has been some discussion as to the effect of Exopthalmic Goitre on the menstrual functions. For the greater part of the year a careful record has been kept with reference to this point, and it is found that 14 per cent. suffered from excessive hæmorrhage, 35 per cent. were quite normal, and 51 per cent. suffered from periods of amenorrhœa.

During 1918, owing to war-time conditions, Dr. Powell White has been so busily engaged teaching at the University that he has been unable to continue the examination of the Pathological specimens sent from the Radium Institute. This work has therefore been carried on by the Clinical Laboratories of the various hospitals participating in the scheme.

With the steady increase in the work of the Radium Institute and the tendency to change its aspect from a purely experimental effort into an essential part of the Medical Organization of Manchester, it now seems to be a suitable time to raise the question of the nature of the premises occupied by the Institute, and the necessity for providing special beds for the treatment of its cases. The Institute is at present located at the Manchester Royal Infirmary, where, of course, it must remain owing to the fact that the vast majority of the Institute's patients come from the Royal Infirmary. Unfortunately the accommodation provided is practically entirely underground, so that work is carried on by the officials under non-hygienic conditions, and even on the brightest days by artificial light. During the course of their duties Radium workers are subject to certain special risks, namely:—

1. Local Effects. These mostly affect the hands, resulting in changes of sensation in the finger tips, cracking of the skin and nails, and loss of elasticity of the tissues at the end of the fingers. In some cases these changes may go on to ulceration, but so far no cases of Epithelioma have arisen such as occur in X-Ray workers. These local dangers are satisfactorily guarded against by

(a) Changing every six weeks the nurse whose duty it is to prepare the apparatus in the morning.

(*b*) Wearing gloves for that work.

(*c*) Handling Radium and Radium emanation as far as possible with forceps, the handles of which are rubber covered. This is particularly necessary in the Physical Laboratory, where there can be no change of assistants, as there is with the nurses.

(*d*) Covering with heavy screens of lead any large supplies of Radium which are kept permanently in the Laboratory or Strong Room. Even with these precautions it is best, if possible, for Radium workers to abstain from handling Radium from time to time for definite periods.

2. General Effects. These are not well known, but whatever they may be they are superimposed upon work of often a peculiarly unpleasant character, as many of the malignant growths which are seen and dealt with are of a particularly foul smelling, poisonous, and disagreeable nature. It is therefore obvious that the hygienic conditions of the

Radium Institute should be of the very best. There should be good ventilation, plenty of fresh air and sunlight, in addition to the necessary holidays.

The question of the provision of beds for the Institute as each year passes becomes of increasing importance. In a large proportion of the cases of malignant disease treated by Radium the improving results have come about through the practice of burying tubes of Radium Emanation in the growths. For this purpose it is necessary for the patients to occupy beds for short periods. Each participating hospital in the Manchester and District Radium Scheme has so far when called upon provided the necessary beds, but the scattering of beds all over Manchester and throughout the Royal Infirmary has manifest disadvantages. In all the hospitals concerned there is always an urgent call for those beds for purely surgical cases, so that it is essential to get patients out again as soon as possible, and thus any system of extended observation of patients treated by Radium is rendered impossible.

The treatment of patients in the scattered beds is an obvious waste of time.

Owing to the increasing number of patients who come for Radium Treatment, there is a tendency for the waiting list of those who have to come as in-patients into hospital to grow. Could a definite number of beds be set on one side for Radium Treatment, it would be possible to deal with a larger number, and so keep down the waiting list to a small size. In addition, a certain number of cases are dealt with as out-patients could be treated over-night in bed, thus employing more fully the Radium at the disposal of the Institute. In this way the Institute would become increasingly efficient in the use of its Radium.

This provision of beds would not, of course, interfere in any way with the treatment of patients in association with surgeons and physicians in the various hospitals of the Manchester district.

After four years' work it will be well to summarize the uses of Radium and give some indication as to the types and classes of diseases in which it is found to be most useful as a curative or palliative agent.

I. Diseases of the Skin.

Radium will commonly cure—

(1) Chronic Eczema with lichenification of the skin.

(2) Pruritus where there is a visible lesion of the skin and the source of chronic irritation has been removed.

(3) Kraurosis Vulvæ.

(4) Keloids and Vicious Scars.

(5) Cavernous Nævi and small Capillary Nævi.

(6) Scrofuloderma.

Radium will ameliorate and sometimes cure—

(1) Lupus Vulgaris. Although Radium sometimes cures this condition, Finsen Light and X-Rays still hold the field; but when the mucous membranes of the eyes or nose are affected, Radium will often produce excellent results.

(2) Lupus Erythematosus.

(3) Psoriasis. The application of plates in this condition often removes the lesion in intractable cases in a wonderful manner, but the disease usually recurs in the course of time.

(4) Large Capillary Nævi. In this condition it is sometimes even with the greatest care difficult to avoid the formation of telangiectases.

II. Benign Tumours and Special Conditions.

Radium will usually cure—

(1) Warts.

(2) Fibromata of the Penis, skin, etc. These tumours are particularly amenable to treatment, and cases of cure of fibromyomata of the uterus are reported.

(3) Myositis Ossificans.

(4) Tuberculous Glands (not caseating).

(5) Spring Catarrh. Radium is the only satisfactory treatment for this hitherto incurable condition.

(6) Intractable Uterine Hæmorrhage. Radium will stop this in practically every case.

III. Medical Diseases.

The most commonly treated of these conditions and the one giving the most satisfactory results is Exophthalmic Goitre.

Marked temporary improvement is also brought about in Spleno-Medullary Leukæmia, Hodgkin's disease, and certain Mediastinal Tumours.

IV. Pre-Cancerous Conditions.

Radium will usually cure—

(1) X-Ray Warts.

(2) Leukoplakia.

(3) Papillomata of the Bladder, when not too advanced.

V. Rodent Ulcer.

Practically all early Rodent Ulcers can be cured by Radium alone. Thirty-one cases to date have been well for two years or more, and there are a number of other cases which have not reported, who are doubtless still well.

VI. Malignant Disease.

(*a*) In the first instance it must be borne in mind that only inoperable cases are at present treated by Radium, and in giving a prognosis in relationship to the effects of Radium Treatment in malignant diseases various factors have to be considered. They are:—

(1) The nature of the growth and its situation. For instance, extremely rapidly-growing tumours like Melanotic Sarcomata cannot be expected to yield good results. It is also found that Carcinoma of the Tongue, taken as a whole, is not very favorable in its reaction to Radium Treatment. *So far it has not been satisfactorily demonstrated that the histological nature of the tumour with a few exceptions has much bearing on the immediate results of Radium Treatment.*

(2) Size. Extremely large growths tend to slough and ulcerate when treated, and the tendency to resolution is small.

(3) Tumors which retain some mobility, have a good blood supply, and are surrounded by healthy tissues, generally respond best to Radium Treatment.

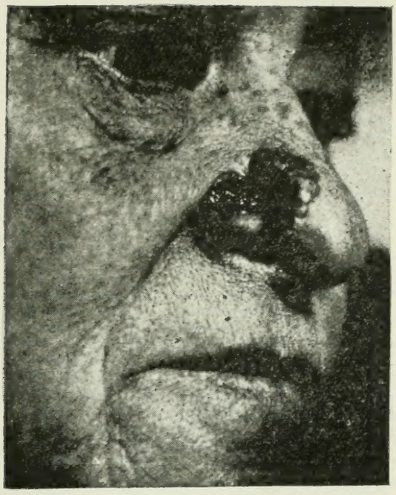
(4) Growths involving bone cannot as a rule be satisfactorily treated.

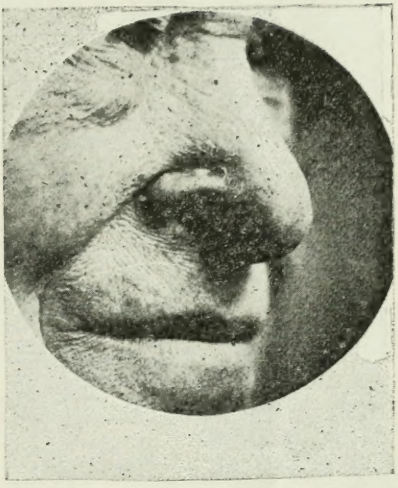
(5) The presence of widespread secondary deposits of course make the outlook much worse for any patient.

Cases which give ultimately the best results are in order of preference.

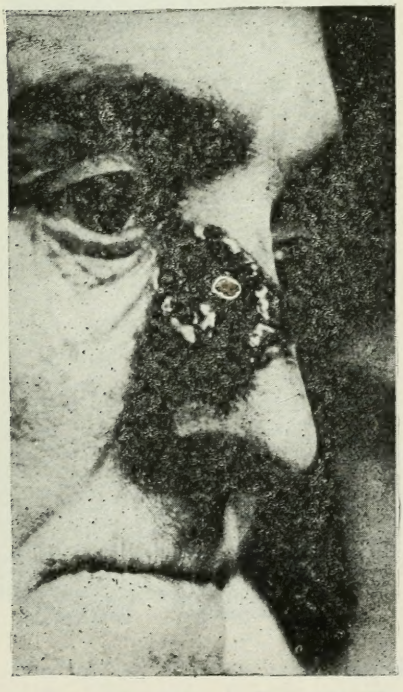
(1) *Carcinoma of the Skin.*

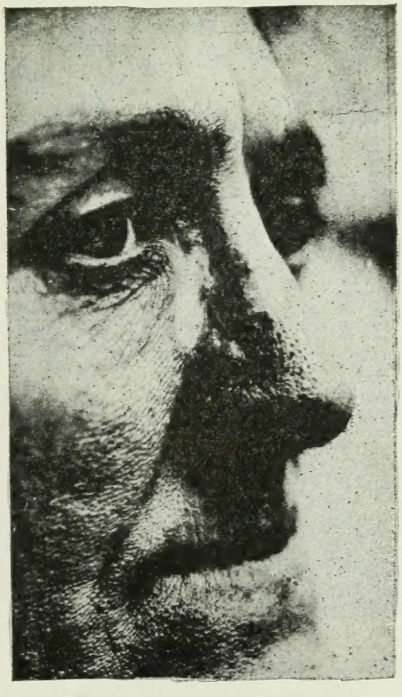
(2) *Carcinoma of the Cervix and Body of the Uterus.* These cases are always treated by burying five to seven platinum tubes, the walls



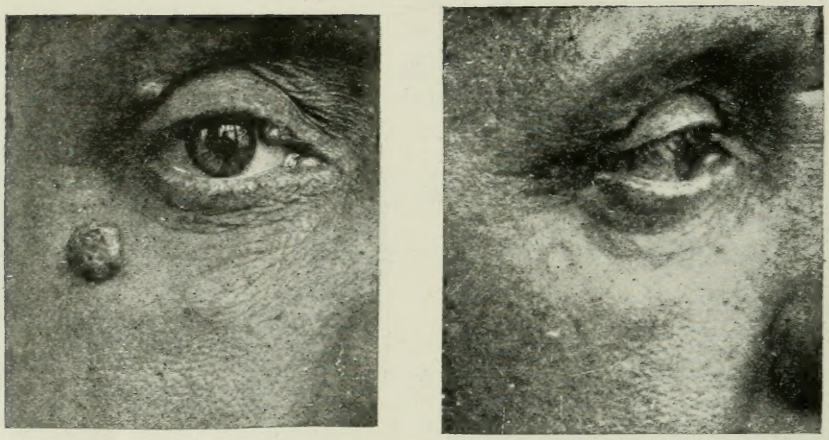


CASE No. 1700. RODENT ULCER (ADHERENT TO CARTILAGE).
Has been well ten months after three exposures of 1½ hours each to unscreened Radium applicators.



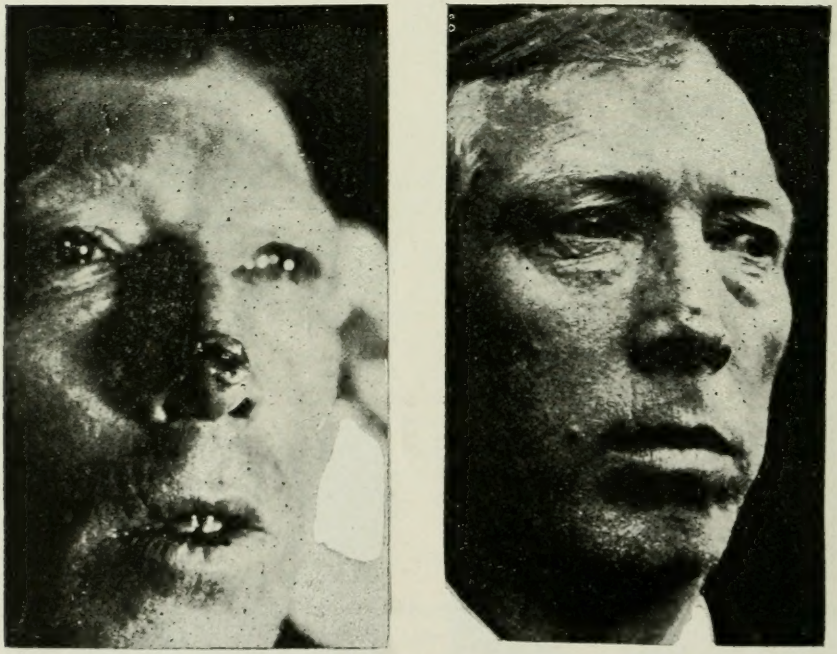


CASE No. 1770 RODENT ULCER (ADHERENT TO CARTILAGE).
Has been well six months. Treatment as for Case No. 1700.



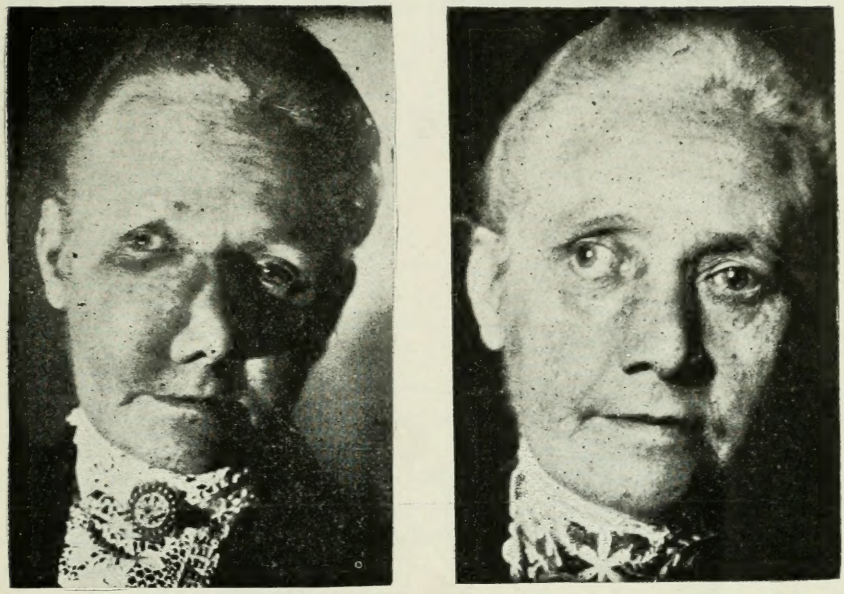
Case No. 1599. RODENT ULCER (?)

Has been well for 18 months after two short treatments.



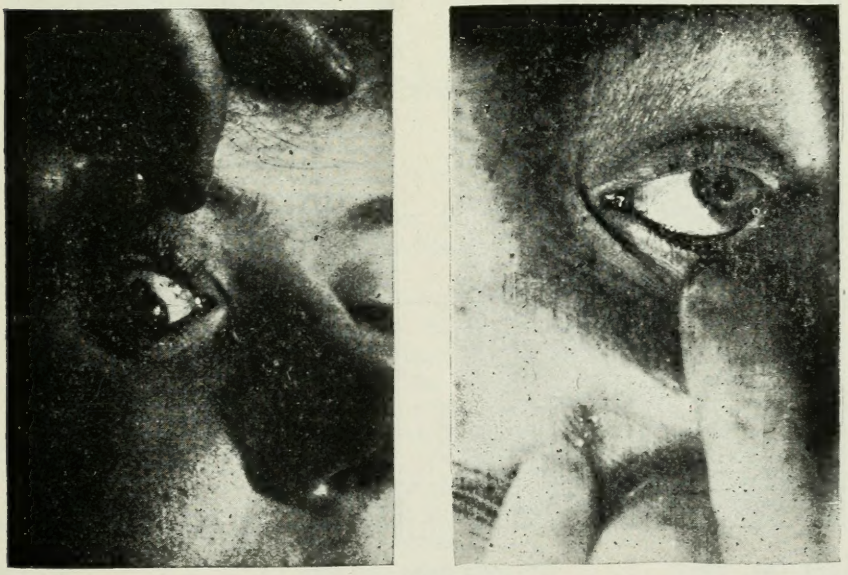
Case No. 1800. RODENT ULCER.

Has been well six months after two unscreened exposures of 1½ hours.



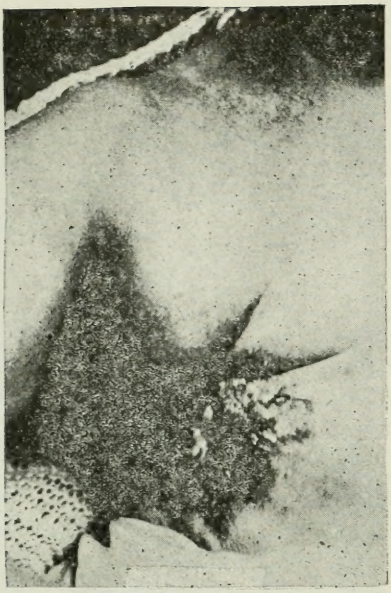
Case No. 174. PERIOSTEAL SARCOMA.

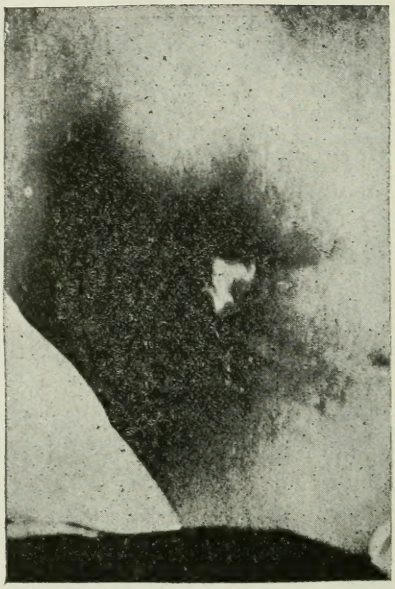
Treated four times by inserting Stevenson and Joly's needles. Remained well for twelve months and then died of another disease. The squint is of infantile origin.



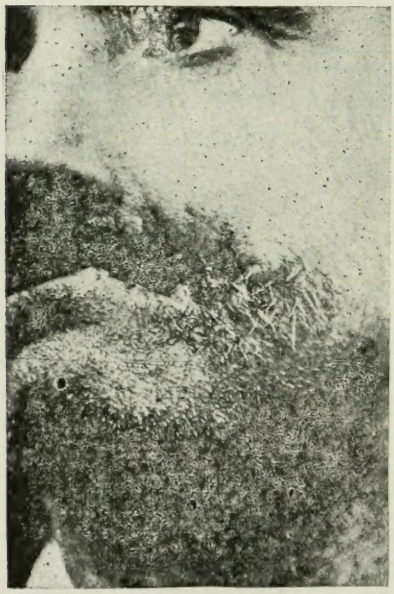
Case No. 1742. SPRING CATARRH.

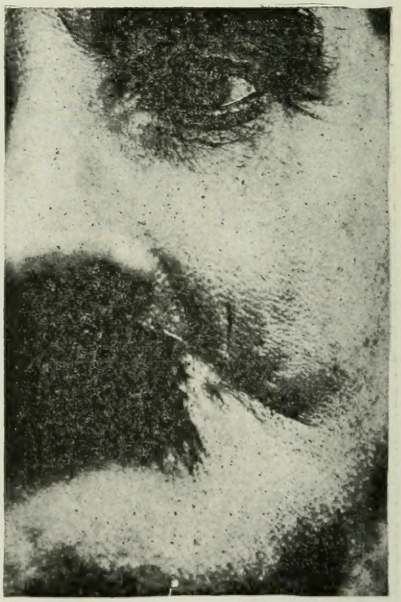
Photograph shows a nodule on the eyeball—a very uncommon position. Treated by four exposures of unscreened Radium plates, each application lasting ten minutes with an interval of a fortnight between each. Has been well for six months.





Case No. 1589. CARINOMA OF BREAST.
Treated entirely by heavily screened Radium plates.
When last seen, six months ago, only slight thickening remained.





Case No. 1705. EPITHELIOMA OF LIP.
Growth was excised but recurred soon afterwards. When first photographed there was extensive induration of inner aspect of cheek. Was treated by inserting three Emanation tubes (10 mc. each) screened by 3/10mm. of Platinum for 24 hours. Only one treatment was given. Has been well over nine months.

of which are three-tenths of a millimetre thick, containing altogether not less than 120 millicuries of Radium Emanation. The tubes are maintained in position for 24 hours by gauze packing. The quantity of Emanation used must vary somewhat with the size of the tumour, but it is found that the best results are not obtained if not less than 120 millicuries are used. This heavy dosage is, of course, somewhat of a drain on the resources of any Radium Institute.

(3) *Endotheliomata.*

(4) *Carcinoma of the Breast.*

(5) *Carcinoma of the Bladder.* This condition is best treated through the supra-pubic opening made by the surgeon in the course of his investigations. In this way tubes of Radium Emanation can be buried in the substance of the Growth.

(6) *Carcinoma of the Thyroid Gland,* if not too large.

(7) *Sarcoma of the Naso-pharynx.*

(8) A few cases of Carcinoma of the Vulva.

(9) *Carcinoma of the Prostate Gland.* Some good results are reported in this condition when it is not too far advanced.

The following is a numerical list of the cases of Malignant Disease treated at the Manchester Radium Institute that have been well for a period of two years or more.

Carcinoma of the Skin	8
Carcinoma of the Breast	6
Carcinoma of the Cervix of the Uterus	5
Carcinoma of the Thyroid Gland	2
Carcinoma of the Tongue	2
Carcinoma of the Ovary	1
Carcinoma of the Bladder	1
Carcinoma of the Colon	1
Carcinoma of the Lip	1
Sarcoma of the Naso-pharynx	2
Sarcoma of Bone	1
Total	30

This shows a total of 30 cases of Malignant Disease previously deemed inoperable which now have been well for a period of two years or more.

(*b*) Apart from the possibility of producing prolonged periods of immunity from malignant disease by Radium Treatment, it is well known that there are certain conditions in which Radium has a very remarkable and rapid effect when employed in the treatment of local tumours.

(1) Lymphosarcoma. In this condition the growth disappears extremely rapidly when irradiated, but usually fresh tumors continue to arise in distant lymphatic glands.

(2) Glioma or Gliosarcoma of the Orbit. This tumour disappears within a fortnight of the treatment, but recurs.

(3) Some Sarcomata, notably inoperable Sarcoma of the Superior Maxilla.

(4) Paget's Disease of the Breast. Local lesions will, as a rule, clear up with Radium Treatment, but as the formation of secondary deposits in the breast and glands is to be expected, it is much more satisfactory to treat these cases by radical operation.

(5) Individual secondary carcinomatous glands if not too large

will rapidly disappear if treated by burying Radium tubes in their substance, but the infection of glands at a distance commonly occurs.

Radium has also other uses in Cancer—

(*c*) It is Used to Extend the Range of Operation.

(1) Radium is frequently employed with this object in cases of Carcinoma of the Breast, either when they are quite suitable for operation with the object of insuring against the possibility of recurrence, or in rather more advanced cases in which the value of operation is doubtful. Some very satisfactory results have been obtained in advanced inoperable cases by locally excising the growth and burying Radium tubes at its site and along the course of the lymphatics, whether the glands be palpably enlarged or not.

(2) Carcinoma of the Bladder. It is often difficult to remove the whole of this tumour when operating. Radium buried in the base of the growth in such cases is often of the greatest benefit.

(3) Carcinoma of the Cervix of the Uterus. A number of inoperable Carcinoma of the Cervix cases have been rendered operable by Radium Treatment. Owing to the formation of a large quantity of fibrous tissue as the result of the application of Radium, the operation is not easy, but can usually be successfully accomplished.

Sufficient time has not gone by to be dogmatic about the ultimate results of these operations, but so far they have been very satisfactory, inasmuch as only one case of subsequent recurrence is recorded. To guard against the risk of recurrence even in the most satisfactory results from Radium Treatment of Cancer of the Uterus, the patient is advised if possible to submit to an operation for the removal of that organ.

(4) Radium has often been of similar service in operations for the removal of Sarcomatous masses.

(*d*) Prophylaxis.

Radium is often employed for this purpose, but where the area to be treated is very large it has its obvious limitations.

(*e*) Palliation.

Apart from the possibility of removing growths, Radium is of great use in relieving the discomfort of patients suffering from hopeless cancer. Thus it is employed to relieve pain, heal ulceration, check discharges, stop bleeding, and in this way to improve the general health of the patients. A great deal of satisfactory work of this kind is done in the treatment of very advanced cases of Malignant disease.

Classified Results.

Table I.

Well at end of year	92
Improved	228
Not improved	80
Died of their disease	20
Not suitable for treatment	68
Too early and no information received	146
Prophylaxis	14
Total	648

The number of cases registered during the year was 648.

TABLE II.

Classification of Cases.

Disease.	Abandoned treatment and too early.	Well at end of year.	Improved.	Not improved.	Died.	Not suitable.	Prophylaxis	Total
Carcinomata:								
Body of uterus	—	1	—	—	1	—	—	2
Bladder	—	2	1	1	1	1	1	7
Breast	22	8	36	6	1	2	2	77
Cervix of uterus	21	16	19	11	2	6	1	76
Colon	—	—	—	2	1	1	—	4
Glands	4	—	3	4	—	3	—	14
Larynx	—	—	1	—	1	5	—	7
Lip	2	2	2	—	—	2	4	12
Mouth and Tongue	12	4	25	8	2	17	1	79
Ovary	—	—	—	—	1	2	—	3
Parotid gland	2	2	1	—	1	—	—	6
Rectum	1	—	9	3	—	2	—	17
Skin	11	9	5	9	2	1	1	38
Thyroid gland	2	—	2	—	—	1	—	5
Various	1	—	3	2	1	2	—	9
Vulva and Vagina	2	3	2	5	—	3	—	15
Sarcomata	10	1	17	8	1	5	2	44
Endotheliomata	2	—	—	—	1	—	1	4
Mediastinal Tumour	—	—	2	1	—	—	—	3
Rodent ulcer	12	18	15	—	—	—	—	45
Papilloma of Bladder	2	1	—	1	—	—	1	5
Benign tumours	12	6	5	1	—	2	—	26
Keloid and vicious cicatrix	3	1	8	1	—	2	—	15
Exophthalmic goitre	9	—	38	7	2	4	—	60
Nævus	3	3	14	3	—	—	—	23
Hodgkins' disease	—	—	5	1	—	5	—	11
Chronic inflammation (Tub. gland)	3	1	2	—	—	1	—	7
Spring catarrh	—	1	2	—	—	—	—	3
Skin diseases	4	5	5	—	—	1	—	15
Uterine hæmorrhage	2	8	—	—	—	—	—	10
Various (non-malignant)	3	—	4	4	—	—	—	11
Paget's Disease	—	—	2	—	—	—	—	2
Blood Diseases	1	—	—	—	2	—	—	3
Total	116	92	228	80	20	68	11	618

THE FOURTH ANNUAL MEETING OF THE AMERICAN RADIUM SOCIETY

The fourth Annual Meeting of the American Radium Society was held June 9th, 1919, at Seaside House, Atlantic City, and the attendance

and papers presented showed the keen interest that is being taken in the therapeutic application of radium. In the absence of the President, Dr. F. E. Simpson of Chicago, Dr. Henry Schmitz of Chicago, presided. The following papers were presented in the Scientific Program:

Radium in Combination with Roentgen Rays, Electro-Coagulation and Surgery, in the Treatment of Malignant Disease. George E. Pfahler, M. D., Philadelphia. Discussion opened by Dr. William L. Clark, Philadelphia.

A Comparative Study of the Action of Radium and Roentgen Rays. Albert Soiland, M. D., Los Angeles. Discussion opened by Dr. Douglas Quick, New York.

The Physico-Chemical Therapy of Radium as Administered in the Treatment of Chronic Arthritis. C. Everett Field, M. D., New York.

The Value of Radium in Curing Disease, Prolonging Life and Alleviating Distressing Symptoms. W. H. B. Aikins, M. D., Toronto. Discussion opened by Dr. William S. Newcomet, M. D., Philadelphia.

Treatment of Carcinoma of the Uterus. John G. Clark, M. D., Philadelphia.

Three Years Experience with Radium in Cancer of the Uterus. Ernest Charles Samuel, M. D., New Orleans.

The Technic and Pathology of Radium Therapy. Henry Schmitz, M. D., Chicago. Discussion of the three preceeding papers opened by Dr. Leda J. Stacy, Rochester, Minnesota, and Dr. John M. Lee, Rochester, New York.

Treatment with Deeply Planted Emanation Tubes. Henry H. Janeway, M. D., New York. Discussion of this paper opened by Charles H. Viol, Ph. D., Pittsburgh.

The Technic of Radium Application in Cataracts. Isaac Levin, M. D., New York. Discussion of this paper opened by Henry Schmitz, M. D., Chicago.

For the next year the following officers were elected:

H. K. Pancoast, M. D., (Philadelphia) President.

Henry Schmitz, M. D., (Chicago) Vice President.

William H. Kennedy, M. D., (Indianapolis) Secretary.

R. E. Loucks, M. D., (Detroit) Treasurer.

In the evening the Annual Banquet was held at Seaside House, Dr. C. Everett Field, Chairman of the Committee on Arrangements, introducing the President-elect Dr. H. K. Pancoast, who announced that the Society would undertake the publication of the papers presented at the meeting, together with their discussion. The guest of the evening, Dr. George D. Stewart, of New York, then spoke on "Prohibition," and in his inimitable manner and out of a profound study of the subject, held all spell bound by his brilliant and witty presentation of this much discussed subject.

It was voted to hold the next annual meeting on the Monday preceeding the opening of the annual session of the American Medical Association, at the place where the American Medical Association next meets, which will be in New Orleans.

REVIEWS AND ABSTRACTS

T. C. Kennedy: The Present Status of Radium Therapy. J. Indiana St. M. Ass., 1919 xii, 36. Abstracted Int. Abst. Surg., Surg. Gynec and Obs. 496, June, 1919.

"This paper is based on the author's experience with 146 cases treated with radium between August, 1914, and December, 1916. Of these, 117 were cases of malignancy. Seventy-five of the patients showed improvement, and 39 were unimproved. In 29 cases of benign conditions good results were obtained in 22 and no improvement in 3. Reported in detail are 2 cases of cancer of the breast in which clinical cures lasting over two years were obtained. In inoperable cancer of the uterus the treatment was almost always followed by marked improvement. There was lessening of the discharge, arrest of hæmorrhage and relief from pain. In quite a number of cases clinical cures resulted. Postoperative recurrences usually proved very refractory, but in 2 cases, of which detailed accounts are given, the patients became apparently well. Patients with cancer of the rectum who come for treatment early, before metastasis occurs, usually have a good chance for relief, and life is frequently much prolonged. A number of cases of epithelioma of the skin in which good results were obtained are reported briefly. Cancers of the buccal and lingual mucous membrane were rather refractory, the results being on the whole disappointing."

"Of benign conditions, uterine fibroids yield readily to radium treatment. Hæmorrhage can practically always be stopped, and in the majority of instances there is marked diminution in the size of the tumor. A typical case is cited in detail. In angioma, keloid, nævi, and lupus erythematosis, radium is of established value. Three patients with exophthalmic goiter were treated, with relief of the nerve and heart symptoms."

"In conclusion, the author quotes Cullen as follows: 'At the present time we know of at least three good things radium has done: (1) It has apparently cured a percentage of surgically inoperable cancer and sarcoma case; (2) it has prolonged life in others; (3) it has relieved pain and done away with or mitigated distressing discharges in not a few. In other words, it has done enough to make us feel that we would want to have it tried on any member of our family that had an inoperable growth.'"

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W. T. Bovie: The Physiological Action of Radiation. J. Med. Research, 1918, xxxix, 271. Abstracted Int. Obst. Surg., Surg. Gyynec. and Obs. 408, May, 1919.

"In 1913, in connection with some experiments upon the temperature coefficient of protein photo-coagulation, the author suggested that radiation causes a chemical change in the more complex and unstable components of the protoplasm and that the biochemical and physiological changes subsequently observed are the results of this photochemical change. The idea was enlarged upon and developed in a paper published in 1916. Bovie says that theories of the mode of action of radiation are but reflections of the philosophy of their times. Undoubtedly, many students of the subject have entertained views similar to these. Neverthe-

less, in discussing the subject with investigators and clinicians, it has often appeared that the ideas were not as clearly crystallized in their minds as in that of the author. The theory has been useful as a guide in directing Bovie's investigations and in interpreting results of others. It seems to be worth while to state it in a more definite form."

"For this purpose the author describes a living organism as a complex of dynamic changes occurring in a colloidal substance called protoplasm. Because of the mutual independence between the course of these dynamic changes and the character of the colloidal protoplasm, it is essential to the continued existence of the organism that the dynamic changes take place in an orderly and controlled manner."

"Any alteration, either physical or chemical, which results from radiating protoplasm may be capable of produucing both physiological and morphological disturbances. At present it matters little whether one says that the action of radiation is physical, chemical, or physico-chemical in nature. Changes of one kind will undoubtedly involve changes of another. Whether or not an alteration takes place will depend on, first, whether the rays are absorbed, and second, whether the absorbing substance or substances very intimately associated with it are photosensitive. In the visible and ultraviolet regions of the spectrum, absorption will depend upon the molecular composition; in the roentgen and gamma regions, upon the atomic composition of the radiated protoplasm."

"The initial change produced by the radiation may or may not be extensive. When special photosensitive sense organs are concerned, it is probably very slight. It will appear later as a structural or functional change in the organism only when the affected protoplasm becomes a critical limiting factor in the particular structure or function under consideration. Subsequent manifestations of the change will depend, therefore, largely upon the methods used in examining the radiated protoplasm. Pronounced changes may be observed in the tissues *en masse*. The microscope will reveal changes invisible to the unaided eye. Studies on permeability will disclose changes unrevealed by the microscope. None of the changes observed are the initial changes ("latent images," as it were) produced by the radiation, but are after-effects developed by metabolic changes taking place in the cell, and they will vary in nature as the particular metabolic processes involved vary.

Slight changes in the chemical composition of proteins often bring about disproportionate changes in their water relations. That radiation may cause changes in a sense opposite to coagulation is shown by some as yet unpublished experiments on gelatin. A two per cent solution of gelatin which was solid at room temperature liquefied when radiated with ultraviolet light and would not solidify again, even when cooled over night in ice-water. It is well known that in the presence of certain salts such as the chromates, gelatin is made insoluble by exposure to light; but Meisling claims to have caused gelatin to set by radiating with ultraviolet light in the absence of such salts. These discordant results have not as yet been cleared up. It has been described at considerable length that both photocoagulations and photocytolysis is radiated protoplasm."

"In more recent experiments, the author found it possible by a slight increase in temperature to 'develop' the initial change produced in the living cell by radiation. He also found that radiated protoplasm is sensitized to heat."

"According to the theory outlined, radiation may be likened to the injection of substances into the cell by a method which does not necessitate

their passing through the cell-limiting membranes, thus transcending the micro-pipette as used by Kite and others; the injected substances are, of course, the photoproducts of the protoplasm. The greater the amount of photochange, or the more the products differ from the protoplasm from which they were formed (i. e., the more "foreign" they are), the greater will be the effect produced. Thus the biological action of radiation may increase with increasing exposure, although not necessarily by any constant ratio."

"In order to evaluate the effect produced, it may be postulated that these substances enter into reaction with the constituents of the cells and through the altered sequence of metabolic changes may affect the whole organism. It becomes at once evident that such an interaction depends not only upon the nature of the formed substance, but quite as much upon the structure and nature of the protoplasm. As a result, the discouraging conclusion is arrived at that for the full and complete solution of the problems it is essential to know the constitution of the cell substances and the relation of this constitution to various physiological functions. On the other hand, it seems that such a statement of the problem leaves the door open for furthur research, demanding investigations into the field of cytology and physiology. In the art of using radiation skillfully, there is possessed a new tool with unique and invaluable possibilities for scientific investigation. The results of these investigations will be contributions not only to the nature of the action of radiation but also to the nature of life-processes."

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H. Janeway: The Treatment of Tumors of the Superior Maxilla. Ann. Surg., Phila., 1918, lxviii, 353-3 Abstracted Int. Abst. Surg., Surg. Gynec. and Obs. 219, March, 1919.

"Janeway reports the result of 55 cases of tumor of the superior maxilla treated during the past three one one-half years by means of radium, assisted when necessary by conservative operations.

Of the benign tumors encountered, the papillomata were the simplest. Two very definite varieties were found, one the simple circumscribed papilloma showing little tendency to metaplasia and resembling in every way the common warts of the skin. The second variety is one which early in its growth forms sessile and very superficial minute papillary projections, which spread superficially over large surfaces and are prone to become true epitheliomata. One case of simple papilloma and one each of the other two varieties were treated with radium. These papillary growths are easily cured by surface applications of radium."

"One case of myzoma was met with. This was cured by radium, but left a bad facial deformity. Two cases of fibrosarcoma, both starting in the nose and subsequently invading the antrum, were in the series. The radium treatment was not successful owing to the late stage at which it was started."

"There were two cases of osteoma of the antrum. These do not yield to radium because of the dense bone of which they are formed. However, it is of service in retarding the growth."

"Two cases of giant-celled sarcoma were reported. In one a single treatment led to complete retrogression of the tumor."

"One case of chrondroma of the superior maxilla was treated with

radium, but at the time the paper was written it was too early to report a definite result."

"One case of melanosarcoma of the superior maxilla was unaffected by radium."

"Of the malignant tumors of the upper jaw, carcinoma attracts the most attention, there being 43 cases in the series. The site of origin of cancer of the upper jaw bears a direct relation to the prognosis. The three principal sites are antral, nasal, and oral. In 21 cases the tumor began in the mouth upon the superior alveolus. In 18 it began supposedly within the antrum, though in 6 the antrum was later found not involved. In 4 it began within or in close relation to the nasal cavity."

"Cancer of the upper jaw is more frequent in males than in females, possibly because men smoke more than women, are engaged in occupations subjecting them to inhalation of dust and inflammatory conditions depending on outdoor occupations."

"Sixty-nine per cent occurred between the ages of forty-five and seventy; 28.5 per cent between fifty and sixty years."

"In the oral cases the first symptom was ulceration. A few patients complained of loosening of the teeth in the superior alveolus. Later there was increase in the size of the ulcer, swelling of the alveolus, and later of the face."

"In the antral cases the first symptom was irritation of the eye, due probably to obstruction of the lachrymal duct, followed by swelling of the face or alveolus, nasal obstruction, pain and often loosening of the upper teeth."

"In the nasal cases, the symptoms were nasal obstruction, discharge, and irritation of the conjunctiva. The regional lymphatics are involved late in the disease."

"In studying the pathology of cancer of the upper jaw, four types of epidermal cancer were found. The simplest form possesses a papillary structure and its epithelial cells form solid intertwining columns with no intervening connective tissue. The squamous cell variety contains pearls and is composed of large atypical pavement cells. This variety is very malignant, causing death by rapid local growth, though the regional lymphatics are not involved until late in the disease. The columnar cell type is as malignant as the squamous cell. The fourth form represents an atypical proliferation of cells, characteristic of the schneiderian musoca. The adamantinomata form a fifth group."

"Carcinoma of the antrum when treated early gave excellent results with the radium."

"There was no immediate mortality from the radium. There was occasionally a primary over-dosage. Those making use of radium should bear in mind that limited improvements mean much to the patient, even though no permanent cure ispossible."

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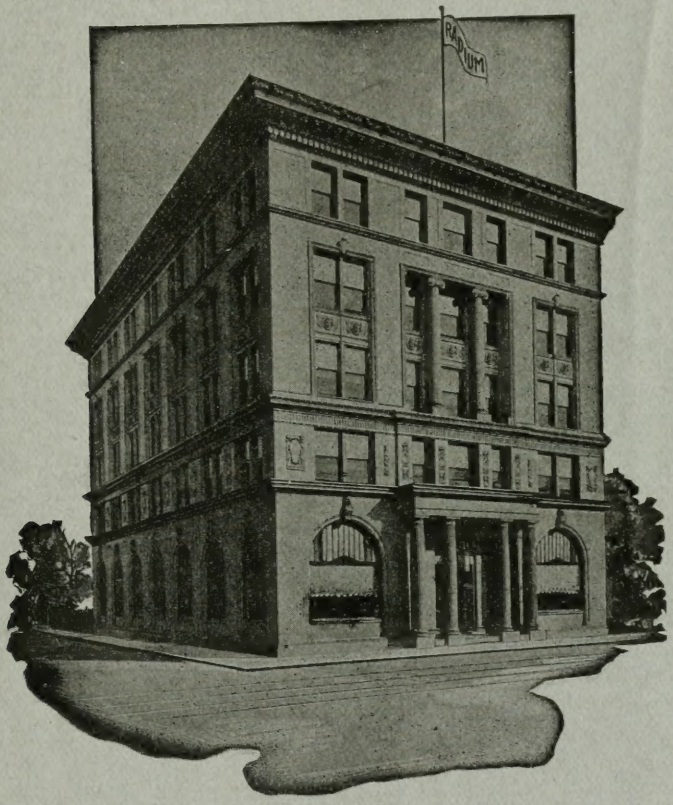

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